

REMARKS

Claims 1-3, 5-15 and 25-41 are pending in the application.

Claims 5 and 6 are amended to address the 35 USC §112, second paragraph rejection noted in the Official Action.

Claims 1-3, 5, 11-13, 15, and 35-38 are rejected as anticipated by TAKAHASHI et al. JP11-186033.

Reconsideration and withdrawal of the rejection are respectfully requested because the reference does not disclose or suggest that an iron carbide film has a body-centered tetragonal structure and a c-axis constitutes a an axis of hard magnetization and a c-plane constitutes a plane of easy magnetization as recited in claim 1 of the present application.

By way of example, page 25, line 20 through page 26, line 6 of the present application, disclose that "from the measurement of a magnetization curve using a vibrating sample magnetometer (VSM), it is difficult for the iron carbon film to magnetize the <001> direction and it is easy to magnetize the <001> direction and the <110> direction. Therefore, it can be confirmed that the c-plane constitutes a plane of easy magnetization. This means that reversal control of the direction of the magnetization occurred in the plane by applying a positive and negative external magnetic field having a proper intensity in the c-plane of the iron carbide film. Accordingly, the iron

carbide film of the present invention is suited for use as a magnetic pole material of a recording head". The above passage provides that the c-plane constitutes a plane of easy magnetization.

As previously set forth in the amendment of May 5, 2003, in conjunction with the drawing submitted for illustrative purposes, the present invention has a c-plane that constitutes a plane of easy magnetization. A thin film having an axis direction of magnetization of the magnetic film in a direction horizontal to the substrate possesses a high saturation magnetic flux density (1.5T or more) and a low coercive force (20e or less) as set forth on page 27, lines 6-13 of the present application and as seen in Figures 9 and 10.

TAKAHASHI et al. teach at paragraph [0010] that the axis direction of easy magnetization of the magnetic film lies perpendicular to a film surface in a direction vertical to the film surface.

The Official Action states that the Examiner interprets claim 1 of the present invention to be met by any FeC having an easy axis of magnetization as there is no reference in the claim that establish which direction the magnetization of the film is oriented. This assertion is not supported by the state of the art. Specifically, MPEP §2111.01 states that the claims must be read as they would be interpreted by those of ordinary skill in

the art. *In re Sneed*, 710 F.2d 1544, 218 USPQ 385 (Fed. Cir. 1983). One of ordinary skill in the art would interpret an axis direction perpendicular to the film surface in a direction vertical to the film surface as the c-axis or the <001> direction. Claim 1 also provides that there is no axis of easy magnetization on the c-plane by the specific recitation of "a c-axis constitutes an axis of hard magnetization".

Accordingly, the statement in the Official Action that claim 1 can be met by any FeC having an easy axis of magnetization is not met by TAKAHASHI. Although claim 1 provides that the c-plane is a plane of easy magnetization and does not specify an axis of easy magnetization, claim 1 provides that the recited c-axis or the <001> direction is an axis of hard magnetization. One of ordinary skill in the art would understand that an axis of hard magnetization could not also be an axis of easy magnetization. Therefore, a statement in the Official Action that there is no reference in the claim that establishes which direction magnetization of the film is oriented, is irrelevant at least as to TAKAHASHI because TAKAHASHI does not meet each of the recited claim limitations as required in an anticipation rejection.

In addition, as also set forth in the amendment of May 5, 2003, an object of the present invention is to have magnetic characteristics such as a high saturation magnetic flux density

(1.5T or preferably 2T or more), and a low coercive force 20e or less, preferably 10e or less. TAKAHASHI is directed to a magnetic recording medium that has a magnetic film that requires a high coercive force. Therefore at least with respect to the coercive force, magnetic characteristics are mutually reversed. One of ordinary skill in the art interpreting the claims of the present invention, particularly in conjunction with the present specification page 63, line 4 through page 66, line 10, would understand that when the c-plane constitutes a plane of easy magnetization this requires a small magnetizing energy and the c-plane is therefore suitable as a material for, for example, exchange-spring magnets and other magnetic devices but would not be suitable for the magnetic recording medium as disclosed by TAKAHASHI.

Since TAKAHASHI discloses that the axis of easy magnetization of the magnetic film is the c-axis and since claim 1 of the present application provides that the c-axis constitutes an axis of hard magnetization, the reference does not disclose that which is recited in the anticipation rejection and is not viable. Reconsideration and withdrawal of the rejection are respectfully requested.

Claims 1-3, 5, 7-8, 15, 25-29 and 34-38 are rejected as unpatentable over KOBAYASHI et al. 4,858,049 in view of TAKAHASHI et al. This rejection is respectfully traversed.

Claim 1 of the present application provides that the iron carbide film has a body-centered tetragonal structure.

As set forth in the Official Action, KOBAYASHI et al. does not teach or suggest a body-centered tetragonal (BTC) structure and the orientation of an axis of easy magnetization. Specifically, column 2, lines 1-19 of KOBAYASHI et al. teach the steps of making amorphous some of the crystal grains of a magnetic film having a high saturation magnetic flux density mainly composed of Fe by adding an element that is interstitially soluble in Fe, the step of reducing its magnetocrystalline and isotropic energy, and reducing thereby its coercive force and increasing its relative permeability and finally obtaining a saturation magnetic flux density of no less than 15 kg (1.5 T) and a relative permeability of no less than 1000. The element or elements added to the magnetic film are preferably at least one element chosen from B, N, C and P and interstitially soluble in Fe.

Table 2 of KOBAYASHI et al. noted in the Official Action, teach a film having a saturation magnetic flux density of 2.13 Tesla and a coercivity of 0.6 Oe, while Table 3 teaches a film having a coercivity of 3.3 to 12.3 Oe. With regard to the transformation into an amorphous state, column 2, lines 43 through 46 of KOBAYASHI et al. teach that it becomes clear that the x-ray analysis peak of magnetic films gets very broad, and

that it is closer to amorphous in comparison with the conventional magnetic films. Accordingly, KOBAYASHI et al. teach that the magnetic film is amorphous, not that the magnetic film is a body-centered tetragonal structure as recited in claim 1 of the present application.

TAKAHASHI et al. teach a BCT structure. The Official Action has not set forth why one of ordinary skill in the art would combine these references such that the proposed combination of references would render obvious claim 1.

In addition, as set forth above, TAKAHASHI et al. require a magnetic film having a high coercive force. As set forth in the Official Action, KOBAYASHI et al. teach a low coercive force, for example, 0.6 Oe (column 4, example 2 of Table 2).

MPEP §2143.01 states that if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

Using a high coercive force as required by TAKAHASHI et al. would render the magnetic film of KOBAYASHI et al. unsatisfactory for its intended purpose as a magnetic recording head. Accordingly, there is no suggestion or motivation to make the proposed modification.

Claims 6 and 39-41 are rejected as unpatentable over KOBAYASHI et al. in view of TAKAHASHI et al. and further in view of CAREY et al. 6,542,341. This rejection is respectfully traversed.

CAREY et al. is cited for the teaching that magnetic films used in magnetic heads should have their magnetization oriented longitudinally as set forth in column 4, lines 1-7 of CAREY et al. However, this passage relates to magnetic sensors such as pin valves in which ferromagnetic free layers are used. Element 30 of CAREY et al. is a magnetic sensor as described at column 4, lines 1-7 of CAREY et al. Magnetic sensor 30 corresponds to magnetic resistance element 81 of Figure 17 of the present application, for example. As such, the magnetic sensor 30 of CAREY et al. does not correspond to a magnetic thin film of the reproducing head as seen in Figure 17 of the present application, for example. Accordingly, CAREY et al. and the present invention are directed to different subject matter and one of ordinary skill in the art would not combine CAREY et al. with the cited references to render claim 6 of the present application obvious.

The Official Action states that between lines 5-10 and lines 58-65 of CAREY et al. there is a passage that reads: "A magnetic head provided with a FeC film is suitable for a recording and reproducing magnetic head for longitudinal or

perpendicular magnetic recording mediums." And that: "It is well known that the direction of magnetization of the main pole of a head is the same as the direction of magnetization of the medium. Therefore, it is easy to fit the FeC film suggested by combining CAREY et al. and TAKAHASHI et al. to the form of the medium". At the end of the rejection, the Official Action notes: "On lines 1-7 of Column 4 of CAREY et al., there is a passage proving this statement reading: "The direction of magnetization of the main pole of a head is in the same direction as the direction of magnetization of the medium."

However, the above underlined remark is irrelevant for the reason given below. In the first place, the present specification teaches that the magnetic head of the present invention can be applied to both inplane (longitudinal) magnetic recording mediums and vertical magnetic recording mediums, and shows Fig. 13 as an example of application of the former and Fig. 17 as an example of application of the latter. It also teaches that the FeC film of the present invention is disposed on the upper magnetic pole 55 and the lower magnetic pole 53 in Fig. 13 and is applied to at least the magnetic pole 85 in Fig. 17.

In Figs. 13 and 17 of the present application, the direction of magnetization of a FeC magnetic film is parallel with the plane of each member on which the magnetic film is applied, while the direction of magnetization of the magnetic

film of the present invention is vertical to the medium plane and is not used differently by the direction of magnetization of the medium. The above-mentioned fact is evident from Figs. 3 and 4 of USP 5,854,727 to TANAKA et al. previously cited in the Office Action of February 4, 2003 and the passage starting on line 50 through 58 of Column 5 of TANAKA et al.

Fig. 4 of TANAKA et al. illustrates the basic principle of a head of vertical magnetic recording mediums and shows a drawing corresponding to Fig. 17 of the present specification. The head for the inplane (longitudinal) magnetic recording medium consisting of a recording head 59 and a reproducing head 58 described in Fig. 13 of the present specification is made of a basic principle identical to that of Fig. 4 of TANAKA et al., and the upper magnetic pole 55 in Fig. 13 corresponds to the component 511a in Fig. 4 of TANAKA et al. In the case of an inplane magnetic recording medium, the arrow of the component 2b in Fig. 4 of TANAKA et al. is directed horizontally. Therefore, "the direction of magnetization of the main magnetic pole of the inplane (longitudinal) magnetic recording medium is not horizontal just as the direction of magnetization of the recording medium but is in a vertical direction and is vertical to the medium plane.

Claim 39 also provides that an iron carbide film has a body-centered tetragonal structure and a c-axis constitutes an

axis of hard magnetization and a c-plane constitutes a plane of easy magnetization. The comments above regarding claim 1 are equally applicable to claim 39.

Claims 9, 11-12, and 14 are rejected as unpatentable over KOBAYASHI et al. in view of TAKAHASHI et al. and further in view of HORI et al. 5,006,395. This rejection is respectfully traversed.

HORI et al. is only cited for the teaching of adding Co to an FeC film to improve the magnetic characteristics of the film. HORI et al. do not teach or suggest what is recited in claim 1. As set forth above, neither KOBAYASHI et al. nor TAKAHASHI et al. teach or suggest what is recited in claim 1. Since claims 9, 11, 12, and 14 depend from claim 1 and further define the invention, the combination of references would not render obvious claims 9, 11, 12, and 14.

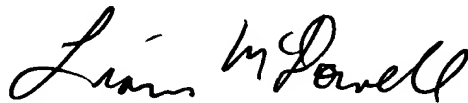
In view of the present amendment and the foregoing remarks, it is believed that the present application has been placed in condition for allowance. Reconsideration and withdrawal of the rejection are respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any

overpayment to Deposit Account No. 25-0120 for any additional
fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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